Eduqas Physics – Component 3

Module D: Energy and the environment

In this topic, learners will consider different factors which affect the rate at which the temperature of the Earth rises. Common sources of renewable and non-renewable energy are discussed and their development as sources of energy, both in the UK and internationally are compared. Learners study the effect of insulation on thermal energy loss and perform quantitative calculations on comparative uses of energy transfer.

You should be able to demonstrate and show your understanding of:	**Progress and understanding:**			
	1	**2**	**3**	**4**
How the following affect the rate at which the temperature of the Earth rises including: the need for thermal equilibrium: that is the balance between energy inflow from the Sun and energy re-radiated from the Earth in the context of global energy demand and the effect of CO_2 levels in the atmosphere				
the origin and means of transmission of solar energy and the form of the Sun's power spectrum including the idea that wavelengths are converted into the near infrared in the atmosphere				
the use of Wien's law ($\lambda_{max} T$ = constant) and Stefan-Boltzman T^4 law in the context of solar power				
use of the density equation and Archimedes' principle to explain why rising sea levels are due to melting ice caps and that the melting of ice on land increases sea levels but melting icebergs do not				
The common sources of renewable and non-renewable energy and be able to compare their development and use both in the UK and internationally **solar power**: • the idea that the main branch of the proton-proton chain is the main energy production mechanism in the Sun • the intensity of power from the Sun $I = \frac{P}{A}$ and the inverse square law for a point source • how to perform energy conversions using photovoltaic cells (including efficiency calculations)				

You should be able to demonstrate and show your understanding of:	Progress and understanding:			
	1	2	3	4
wind power: • the power available from a flowing fluid $= \frac{1}{2}A\rho v^3$ • the factors affecting the efficiency of wind turbines • produced from wind				
tidal barrages, hydroelectric power and pumped storage: • the principles of energy conversion (E_p to E_k) in tidal barrage, hydroelectric and pumped storage schemes and be able to carry out energy and power calculations related to these schemes and compare with the energy				
nuclear fission and fusion: • the principles underlying breeding and enrichment in nuclear fission applications • the difficulties in producing sustained fusion power - fusion triple product				
The principles of fuel cell operation and the benefits of fuel cells particularly regarding greenhouse gas emissions				
The thermal conduction equation in the form $\frac{\Delta Q}{\Delta t} = -AK\frac{\Delta\theta}{\Delta x}$				
The effect of insulation on thermal energy loss and be able to calculate the heat loss for parallel surfaces using the rate of energy transfer $=UA\Delta\theta$ including cases where different materials are in contact				